

Application Serial No. 09/513,702
Amendment Dated March 22, 2004
Reply to Office Action of November 20, 2003

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listing of claims in the application:

Claim 1 (currently amended): A semiconductor ~~pumping~~ laser device comprising:

a resonator cavity having a first end face and a second end face, and comprising a cavity portion between the first and second end faces, the cavity portion having a length greater than ~~or equal to~~ 1200 μm and a width along the entire length that can only support a single transverse mode;

a laminated structure of [[a]] semiconductor material formed on a substrate and including a lower cladding layer, an active layer disposed over the lower cladding layer, and an upper cladding layer disposed over the active layer, [[an]] the active layer comprising at least one quantum well structure, the upper cladding layer having a mesa stripe that is oriented along the cavity length, the top of the mesa stripe being configured to receive current applied to the laser device, said resonator cavity comprising at least a portion of said laminated structure ~~said laminated structure being formed on a substrate and having at least a portion disposed in said cavity portion;~~

at least one cover layer disposed over at least one portion of the upper cladding layer and adjacent to the mesa stripe;

a low-reflection film formed having a reflectance of 5% or less on one end face of the structure; and

a high-reflection film having a reflectance of 80% or more formed on the other end face of the structure; and

wherein the semiconductor laser device has intervals between adjacent longitudinal oscillation modes, at least one of the intervals being equal to or less than 0.12 nm.

Claim 2 (original): The semiconductor laser device according to claim 1, wherein said device has a transverse light confinement structure with the transverse refractive index difference of about 1×10^{-2} for oscillation modes.

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Claim 3 (original): The semiconductor laser device according to claim 1, wherein the reflectance of said low-reflection film on the one end face is 5% or less.

Claim 4 (original): The semiconductor laser device according to claim 1, wherein said active layer is formed of one or two quantum well structures.

Claim 5 (previously presented): The semiconductor laser device according to claim 1 wherein the coefficient of light confinement to the active layer ranges from 1% to 2%.

Claim 6 (previously presented): The semiconductor laser device according to claim 2, wherein the coefficient of light confinement to the active layer ranges from 1% to 2%.

Claim 7 (previously presented): The semiconductor laser device according to claim 3; wherein the coefficient of light confinement to the active layer ranges from 1% to 2%.

Claim 8 (previously presented): The semiconductor laser device according to claim 4, wherein the coefficient of light confinement to the active layer ranges from 1% to 2%.

Claim 9 (previously presented): The semiconductor pumping laser device of Claim 1, wherein said device emits light in the 0.98 μm wavelength-band.

Claim 10 (previously presented): The semiconductor pumping laser device of Claim 9, wherein the output light of the laser is free of kinks for driving currents up to at least 350 mA, where a kink is a variation of 15% or more in the external differential quantum efficiency of the laser relative to the initial value present when the injected current just exceeds the threshold current.

Claim 11 (previously presented): The semiconductor pumping laser device of Claim 9, wherein the output light of the laser is free of kinks for driving currents up to at least 700 mA.

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where a kink is a variation of 15% or more in the external differential quantum efficiency of the laser relative to the initial value present when the injected current just exceeds the threshold current.

Claim 12 (previously presented): The semiconductor pumping laser device of Claim 9, wherein said active layer has no more than two quantum wells, wherein said substrate comprises gallium arsenide, and wherein said laminated structure includes at least gallium and arsenic.

Claim 13 (previously presented): The semiconductor laser device according to Claim 9, wherein said device has a transverse light confinement structure with the transverse reflective index difference of about 1×10^{-2} for oscillation modes.

Claim 14 (previously presented): The semiconductor laser device according to Claim 9, wherein the coefficient of light confinement to the active layer ranges from 1% to 2%.

Claim 15 (previously presented): The semiconductor pumping laser device of Claim 1, wherein the light output of the laser device is coupled to a optic fiber such that light from an optical fiber is fed back to the laser device.

Claim 16 (previously presented): The semiconductor pumping laser device of Claim 1, wherein said active layer has no more than two quantum wells, wherein said substrate comprises gallium arsenide, and wherein said laminated structure includes at least gallium and arsenic.

Claim 17 (previously presented): The semiconductor pumping laser device of Claim 16, wherein said laminated structure further include at least indium and nitrogen.

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Claim 18 (previously presented): The semiconductor pumping laser device of Claim 16, wherein the output light of the laser is free of kinks for driving currents up to at least 350 mA, where a kink is a variation of 15% or more in the external differential quantum efficiency of the laser relative to the initial value present when the injected current just exceeds the threshold current.

Claim 19 (previously presented): The semiconductor pumping laser device of Claim 16, wherein the output light of the laser is free of kinks for driving currents up to at least 700 mA, where a kink is a variation of 15% or more in the external differential quantum efficiency of the laser relative to the initial value present when the injected current just exceeds the threshold current.

Claim 20 (previously presented): The semiconductor pumping laser device of Claim 16, wherein the light output of the laser device is coupled to a optic fiber such that light from an optical fiber is fed back to the laser device.

Claim 21 (previously presented): The semiconductor laser device according to Claim 16, wherein said device has a transverse light confinement structure with the transverse reflective index difference of about 1×10^{-2} for oscillation modes.

Claim 22 (previously presented): The semiconductor laser device according to Claim 16, wherein the coefficient of light confinement to the active layer ranges from 1% to 2%.

Claim 23 (previously presented): The semiconductor pumping laser device of Claim 1, wherein the output light of the laser is free of kinks for driving currents up to at least 350 mA, where a kink is a variation of 15% or more in the external differential quantum efficiency of the laser relative to the initial value present when the injected current just exceeds the threshold current.

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Claim 24 (previously presented): The semiconductor pumping laser device of Claim 23, wherein the output light of the laser is free of kinks for driving currents up to at least 700 mA, where a kink is a variation of 15% or more in the external differential quantum efficiency of the laser relative to the initial value present when the injected current just exceeds the threshold current.

Claim 25 (previously presented): The semiconductor pumping laser device of Claim 23, wherein the light output of the laser device is coupled to a optic fiber such that light from an optical fiber is fed back to the laser device.

Claim 26 (previously presented): The semiconductor laser device according to Claim 23, wherein said device has a transverse light confinement structure with the transverse reflective index difference of about 1×10^{-2} for oscillation modes.

Claim 27 (previously presented): The semiconductor laser device according to Claim 23, wherein said active layer comprises no more than two quantum well structures.

Claim 28 (previously presented): The semiconductor laser device according to Claim 23, wherein the coefficient of light confinement to the active layer ranges from 1% to 2%.

Claim 29 (currently amended): A semiconductor ~~pumping~~ laser device comprising:

a resonator cavity having a first end face and a second end face, and comprising a cavity portion between the first and second end faces, the cavity portion having a length greater than ~~or equal to~~ 1200 μm and a width at each point along the length of the cavity portion that can only support a single transverse mode;

a laminated structure of [[a]] semiconductor material formed on a substrate and including a lower cladding layer, an active layer disposed over the lower cladding layer, and an upper cladding layer disposed over the active layer, [[an]] the active layer comprising at least one quantum well structure, the upper cladding layer having a mesa

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- 10 stripe that is oriented along the cavity length, the top of the mesa stripe being configured to receive current applied to the laser device, said resonator cavity comprising at least a portion of said laminated structure ~~said laminated structure being formed on a substrate and having at least a portion disposed in said cavity portion;~~
at least one cover layer disposed over at least one portion of the upper cladding
15 layer and adjacent to the mesa stripe;
a low-reflection film formed having a reflectance of 5% or less on one end face of the structure; and
a high-reflection film having a reflectance of 80% or more formed on the other end face of the structure; and
20 wherein the semiconductor laser device has intervals between adjacent longitudinal oscillation modes, at least one of the intervals being equal to or less than 0.12 nm.

Claim 30 (new): The semiconductor laser device of Claim 1 wherein the at least one cover layer comprises a dielectric material.